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Differences in wealth, evidence from structural regression decomposition, 1850-1870

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Abstract. Recent studies have used regression decomposition to analyze recent data and found that over seventy percent of the black-white wealth differences remained unexplained (See, e.g., Gittleman & Wolff 2000; Altonji, Doraszelski & Segal 2000; and Blau & Graham 1990). Their results are limited to the variation in modern data. This study contributes improved methodology and historical empirical results to the literature on economic discrimination. In this paper, (i) presents structural regression decompositions, which are modifications to methods developed by Becker (1957) and Oaxaca (1973); (ii) presents a basic empirical test when analyzing structural regression decompositions; (iii) reports the estimated sources of black-white differences in wealth directly before and after emancipation; (iv) links these findings to recent studies. Empirical estimates confirm that the size and persistence of modern black-white wealth differences have historical roots. (v) presents decision-making considerations of "individuals" in an economy with grouped individuals, owners of firms, and social planner(s), conditional on wealth constraints with applied social economic considerations.
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JEL. J70, D90, E20, C20, H50, N30.

1. Introduction

The study of racial differences in factor market supply decisions and prices, as reflected in the extensive literature on labor supply, wages and income, presents only a subset of the variables that determine the accumulation and storage of assets over the lifetime of black and white households. Brimmer (1988) stated " The ownership of wealth by blacks reflects the same pattern of deficits evident when one looks at money income. However, the shortfall of wealth is much larger. To a considerable extent the latter can be traced to a long history of deprivation in this country" (p.153). However, the empirical analyses necessary to substantiate this proposition have been absent in the literature because the origin of the black-white wealth gap is vastly understudied. Researchers typically conduct statistical tests on the most recent data to analyze wealth differences by race and use these results to propose policies that address the wealth gap. But this methodology confines such tests to the variation observed in recent data. Instead, I propose conducting similar tests using historical data and comparing these results to studies using recent data. I employ such an approach in this paper and provide new insights about the historical and intertemporal dimensions of the black-white wealth gap.

The structure of the paper is as follows: Section I: I present a review of the literature on modern black-white wealth differences and a brief discussion on the theory behind these differences; Section II: I present the method of structural

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regression decomposition and an empirical test; Section III: I present the empirical results and provide a brief summary; and Section IV: I present several appendices, including an analysis the sample dataset and descriptive statistics.

2. Literature Review

Overall, economic research shows that wealth differences were larger than income differences. Brimmer (1988) used 1984 US census data to find that blacks held 7.2 percent of US income and only three percent of US wealth. Additionally, Wolff (1992) uses SCF, SFCC, and SIPP data from 1940 – 1988 to show that blacks possessed between 13-23 percent of white mean wealth and 4-10 percent of white median wealth. Wolff (1998) affirms his earlier results using SCF data. He shows that the black-white ratio of mean net worth fell to 17 percent by 1995 while the ratio of median net worth rose to only twelve percent.

Blau & Graham (1990) produced a foundational study of black-white wealth differences using regression decomposition. They employed data from the National Longitudinal Surveys (NLS) of young men and women in 1976 and 1978, respectively, to conduct regression decompositions of wealth by race. After controlling for income and demographic variables, they found that 78 percent of wealth gap remained unexplained. But they obtained different results when decomposing wealth based on white and black coefficient weights: 22 percent of blackwhite wealth differences (for couples and singles) were unexplained using white coefficients.

However, 74 percent (for couples), and 97 percent (for singles) of black-white differences were unexplained using black coefficients. They state that "from a policy perspective, the more relevant question appears to be one addressed when black functions are employed: what would happen to black wealth if blacks were given the white means but retained there own functions?" (p. 332). Based on the large unexplained differences in wealth, they proposed that barriers to businesses and housing, differences in labor market uncertainty1 and differences in inheritances may be possible sources of these differences.

Altonji, Doraszelski & Segal (2000) confirmed large unexplained differences in wealth among blacks and whites. They analyzed a sample of pooled data from the Panel Study of Income Dynamics (PSID) in 1984, 1989 and 1994 by multiple models of regression decomposition and found that 70 percent of the differences were still unexplained, based on the results using black coefficient weights. Their OLS decompositions show large unexplained black-white wealth differences using black and white coefficients: Explained wealth differences were six percent for couples and 27 percent for single males using black coefficients, and 67 percent for couples and 108 percent for single males using white coefficients. Gittleman & Wolff (2000) also confirmed large unexplained black-white differences. They used PSID data from 1984-1994 and found at least 75 percent of differences remained unexplained depending on the coefficient. Using black coefficients, 32 percent of the wealth differences were explained in 1984, 44 percent in 1989, and 28 percent 1994, and using whit coefficients, 81 percent (1984), 78 percent (1989), and 77 percent (1994) of the wealth differences were explained. Furthermore, using simulated counterfactuals and substituting observed savings and inheritance rates in black wealth function, the authors found the gap would remain and take another 72 years to close gap. For an extended review of the modern literature see Appendix A.

However, these studies lack a sufficient time dimension to understand the evolution of black-white differences in wealth. Comparing empirics from decompositions that are further apart in time, for instance, may help identify the underlying causes of black-white differences in wealth. Additionally, a thorough analysis of the variables that explain wealth accumulation patterns would provide readers additional confidence in the results 2. This study attempts to address these concerns by analyzing the source of the black-white wealth gap directly before and

after emancipation of blacks in the United States, and comparing historical differences to modern differences.

In this study, I employ Integrated Public Use Microdata Samples (IPUMS) collected from the US. The final sample includes a 1-in-100 random sample from the 1850-70 censes and supplemental samples of 1-in-50 blacks in 1860 and 1870. The racial breakdown of the pooled sample is 21,416 blacks and 154,569 whites. See Appendix B for an analysis of the data source and descriptive statistics.

3. Econometric analysis

The following statistical methods will employ a modified form of regression decomposition to analyze the wealth discrimination coefficient. Oaxaca (1973) applied the market discrimination coefficient to formulate a regression decomposition of wage differences by gender, commonly known as the Oaxaca decomposition. Researchers have applied the decompositions presented by Oaxaca (1973), Blinder (1973) and Juhn, Murphy & Pierce (1991) to studies of gender, ethnicity and racial discrimination in wages, income and wealth.

To test the source of differences in wealth among blacks and whites, I conduct structural regression decomposition. Structural regression decomposition suggests that the aggregate variation of parameterized variables, identified by economic theory, can be completely captured even though the econometric model is reduced in form. This result should hold as long as the components in the composite error term are uncorrelated with each other and the explanatory variables.

Although *wage* data is not in available in the data set, this does not hinder our analysis. Wages are determined by the value of the marginal product of labor plus a discrimination coefficient. Marginal products are empirically difficult to observe but we can use a proxy variable such as literacy to capture this theoretical relationship. The ability to read and write, or literacy, might be interpreted as a minimum level of schooling required for higher productivity. Since we can expect a positive relationship between literacy and the marginal product of a laborer, we can also expect a positive relationship between literacy and wages. Thus, since we expect a positive relationship between wealth and wages, according to the identity, we can expect wealth and literacy to be positively correlated in the regression analysis 9.

The wealth identity shows that more *hours of work and* lower *consumption* causes wealth to grow. Ham, Jakubson & Reily (1998) present a

> "'Quasi - Marginal Rate of Substitution' equation between labor and consumption to empirically estimate explanatory variables for hours of work and consumption. Since it is formed from the demand equations… thus contains the price of other nondurable consumption. The usual marginal rate of substitution equation between hours and food consumption based on the first order conditions… would contain instead the quantity of other non-durable consumption which is not observed in the PSID" (p.10). Thus, when data on hours of work and consumption are not available, unemployment rates and prices can be used as a proxy10.

Initial wealth is determined by social endowment, family endowment, and preferences for parental versus child consumption. None of these variables are available in the dataset, but the constant reports the amount of wealth held by individuals when all other variables equal zero. Thus, the constant produces a strong estimate of the impact of initial wealth on current wealth

Finally, the *rate of return* is explained by age variables. Age variables control for life cycle investment decisions. Including age and age-squared in the regression equation assumes a concave relationship between age and wealth. Masson (1986), Mirer (1979) and Shorrocks (1975) found cross-sectional age-wealth profiles that were concave only when they did not control for factors such as cohort and mortality differences.

Thus, we can rewrite the structural regression in terms of a reduced form of the parameters. See Appendix C for more literature concerning the wealth identity.

Empirical Test

The following empirical test more directly ascertains the source of black-white wealth differences when using regression decomposition.

This test states that the differences in wealth explained by differences in wealth due to differences in characteristics are greater than differences in wealth due to differences in returns to characteristics,. If the test holds, we do not reject the proposition that a significant portion of black-white wealth differences can be explained by differences in investing in the optimal wealth-generating characteristics. If the test fails to hold, then we can reject the proposition.

To conduct this test, I will obtain estimated parameters and sample means from a subsample of married household heads, a sub-sample of single household heads, and a pooled sample of all household heads to calculate the explained and unexplained differences in wealth among blacks and whites in 1860 and 187014. Then, I will compare these results to estimates by Blau & Graham (1990); Altonji, Doraszeki & Segal (2000); and Gittleman & Wolff (2000).

4. Empirical results

Estimates show that large, unexplained, black-white differences in wealth levels can be traced back to the era before and directly after emancipation. 73.9 percent of the 1860 differences in black and white wealth were due to different returns to the optimal wealth-generating characteristics. This result was based on estimates using (i) level differences in wealth, (ii) the pooled sample of married and single household heads, and (iii) black coefficients. However, these estimates remained between 64.8 percent and 84.3 percent even when estimating unexplained differences in black and white wealth levels using married or single household heads and white coefficients. By 1870, unexplained differences in wealth levels grew to a range between 79.3 percent and 87.2 percent using black coefficients but results also began to depend on coefficients analyzed.

These results show that the three quarters of wealth level differences first observed by Blau & Graham (1990) have historical roots.

Estimates of black-white log wealth differences produce large but less dramatic unexplained differences in wealth. For the pooled sample, unexplained black-white differences in log wealth were approximately 45.4 percent using either the free black or white coefficients. 42.2-43.0 percent of the black-white differences in log wealth were unexplained among married free black and married white households. However, these unexplained differences grew dramatically for single households in 1860. The differences in log wealth due to differences in returns to the optimal wealth-generating characteristics grew to a range between 75.9 and 55.0 percent among single free black and single white households. The difference in these results may be explained by the relative stability of married households due to a possible longer experience of freedom. Married, free black households were more likely to be free over multiple generations and able to structure their experience in manner that is conducive to wealth accumulation while single households may be recently freed slaves or refugee slaves. These single, free black households may not have had the tradition of investing their savings in a manner conducive to wealth accumulation producing larger differences in the returns to the optimal wealth-generating characteristics 15. Black-white differences in log wealth among single and married households followed the same pattern in 187016.

Results can also be used to compare pre- and post-emancipation wealth within groups. Almost all white wealth losses were unexplained between 1860 and 1870. The pooled and married samples show that differences in wealth due to differences in returns to characteristics ranged between 84.1 percent and 110.2 percent using (i) differences in log wealth and wealth levels, and (ii) 1860 and 1870 coefficients. Unexplained differences in wealth were only slightly lower using the sample of single household heads. Thus, we may be able attribute nearly all of its losses in white average wealth between 1860 and 1870 due to southern dependence on the

abolished practices of slavery. This proposition will be analyzed when these results are further decomposed.

Similarly, when focusing on the 1860 free black coefficients, all of the differences in black wealth between 1860 and 1870 can be traced to freedom-slavery differences. 99.7 percent to 150.0 percent of log and level wealth differences among 1860 free blacks and 1870 ex-slaves were due to differences in returns to the optimal wealth-generating characteristics. Thus, blacks experienced a 100 percent return to freedom.

Decomposed Differences. To analyze the estimates in a more detailed manner, the pooled samples were further decomposed. Oaxaca & Ransom (1999) reminds us to be careful when decomposing regressions with dummy variables beyond explained and unexplained differences:

> "Generally, conventional decomposition methodology cannot identify the separate contributions of dummy variables to the wage decomposition, because it is only possible to estimate the relative effects of a dummy variable. So the discrimination component is not invariant to the choice of the 'left-out' reference group… However, overall decomposition into discrimination and qualifications is invariant to the choice of reference groups, so that major results of papers attempting to make separate imputations of discrimination to the unadjusted wage differential are not affected" (p.154).

Thus, given the set of variables analyzed, the contribution of the rate of return, as measured by age, and preferences, as measured by the number of household members and children, are the only invariant results.

Foremost, literacy was employed as a proxy measure for wages differences among blacks and whites. Between 1860 and 1870, black-white differences in log wealth due to differences in literacy ranged between 7 and 26 log basis points relative to illiterates. However, differences in returns to literacy ranged between 70 and 74 log basis points relative to illiterates. The rate of return, as measured by age, has a larger impact on log wealth differences due to literacy. Differences in returns to age increased 1860 black-white differences in log wealth by 233 log basis points. By 1870, black-white differences in returns to age grew to 605 log basis points. These results show that black-white differences in returns to the growth rate of wealth outweighed differences in log wealth due to differences in investments in and returns to literacy.

The decomposed results can also be used to compare pre- and post-emancipation wealth within groups. 1860-1870 differences in literacy and differences in returns to literacy caused log wealth differences to grow or fall by no more than ten log basis points relative to illiterates for both blacks and whites. Note that differences in log wealth due to southern residence were much larger for both blacks and whites. The mass residence of 1870 ex-slaves in the south relative to the more even dispersion of 1860 free blacks and the decline in southern wealth accumulation after emancipation caused 1860-1870 black wealth differences to grow 115 log basis points relative to the Midwest while 1860-1870 white wealth differences grew 30 log basis points relative to Midwestern whites due to differences in returns to residing in the south. Southern residence was the largest factor that expanded 1860-1870 white wealth differences, confirming earlier results that most of 1860 white wealth losses were due to southern dependence on slaves that were emancipated. But the rate of return was the fact expanded 1860-1870 black wealth differences the most: differences in free black-ex-slave wealth grew 191 basis points due to differences in the return to age17.

Thus, these results may provide evidence that continuously compounded growth rates of wealth caused by large initial wealth differences contributed to significant black-white wealth differences before and after emancipation.

Empirical Tests. The empirical test results show that unexplained differences in wealth were a significant portion of black-white differences in wealth. Since the test statistics does not exceed K for all cross-sections and time periods, we reject that proposition that a significant portion of black-white wealth differences can be

explained by differences in investing in the optimal wealth-generating characteristics.

Furthermore, these statistics can be used to analyze long-run patterns in black-white wealth differences. When observing test statistics based on wealth levels and black coefficients, results from the pooled sample are less conclusive than results from the married and single samples. Test statistics from the sample of single household heads grow from 0.15-0.19 in the mid nineteenth century to 0.28 in the mid 1970's to 0.37 in the 1980's through the 1990's. Thus, unexplained differences in black and white wealth remain significantly large over the last 140 years but black-white differences are, somewhat, increasingly explained by characteristics of the single household head. To the contrary, test statistics from the sample of married household heads fell from 0.32 in 1860 to 0.26 in 1870, which remained approximately the same through mid 1970's at 0.28 to 0.06 in the 1980's through 1990's. Thus, even when blacks structured their household in manner conducive to generating wealth, as might be represented by households with two productive adults, unexplained differences in black and white wealth were persistent and compounded over time.

5. Summary

This paper presents a structural decomposition of differences in wealth among blacks and whites over the last 140 years. The standard analysis, based on the market discrimination coefficient and the Oaxaca decomposition, was modified because it does not capture differences in the underlying processes that determine wages and wealth. Additionally, the empirical test provides a systematic method for analyzing results from regression decompositions. To summarize the results in this paper, (i) I confirmed that large, unexplained black white differences in modern wealth have historical roots; (ii) I found that most of white wealth losses after emancipation were due to southern dependence on the abolished practice of slavery; (iii) I found that 100 percent of the wealth differences between 1860 and 1870 blacks were due to freedom—or lack of freedom—(iv) I found that the compounding growth rate of wealth was a dominant factor in black-white wealth differences; and (v) I found that unexplained differences in black and white wealth continue to persist and grow over time. These results may indicate that initial *nominal* differences in wealth and the returns to the optimal wealth-generating characteristics vastly understate the *effective* differences, which are continuously compounded over time and across generations.

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Notes

1 Ham (1982) describes how labor market constraints impact worker decisions.

2 Gittleman & Wolff (2000) critique results produced by Blau & Graham (1990). "It is evident that, as in past research, the amount of wealth difference that can be 'explained' hinges critically on the coefficients… Blau & Graham (1990) use their decomposition results to make speculations as to whether the large differences in wealth functions are related to differences in savings behavior, capital appreciation or intergenerational transfers. Because of the methodological difficulties with this approach, we use a different procedure" (p.5).

7 Oaxaca (1973) states: "It is clear that the magnitude of the estimated effects on discrimination critically depends upon the choice of control variables for the wage (or wealth) regressions. A researcher's choice of control variables implicitly reveals his or her attitude toward what constitutes discrimination in the labor market. If it were possible to control for virtually all sources of variation in wages, one could pretty well eliminate labor market discrimination as a significant factor in determining wage differentials.... the other extreme is to control for virtually nothing and thereby minimize the role of productivity differences" (p.699).

8 " McCallum (1972) and Wickens (1972) show that the asymptotic bias (actually, degree of consistency) is worse if the proxy variable is omitted, even if it is a bad one (has a high proportion of measurement error). This neglects, however, the precision of the estimates. Aigner (1974) analyzed this aspect of the problem and found, as might be expected that it could go either way. He concluded, however, that 'there is evidence to broadly support use of the proxy'" (Greene 1997, p.443).

9 Note that the discrimination coefficient in the wage will be captured when decomposing the regression into unexplained effects.

10 Data on unemployment rates are not available in this dataset.

11 Oaxaca & Ransom (1999) show that the size of constant is sensitive to the referenced variables when dummy variables are employed. But this sensitivity does not affect the amount of the unexplained differences in average wealth between two groups when aggregated.

12 Juhn, Murphy & Pierce (1991) reformulated these decompositions into observed and unobserved parts of differences in wages. But applying the their method of decomposition to wealth may errantly ignore the difficulties of inference due to the reduced-form regression. The reduced-form error term is a function idiosyncratic and person-specific disturbance in wealth, and the proxy variables for wages, hours of work, commodity prices and commodity consumption. I employ occupational skill dummy variables to capture most of the person–specific variation. But further decomposition of unobserved variation will simply capture more idiosyncratic disturbance from multiple sources of variance than unobserved structure.

13 With this formulation of wealth, we cannot infer about the contribution of prices to current wealth. Note that such inference is limited since we cannot separately identify the contribution of hours of work, commodity consumption and commodity prices using the price index. Here, the inference gains to analyzing the value of wealth upon liquidation far outweigh the losses from not estimating reduced form parameter on price using this dataset.

14 Blau & Graham (1990), Altonji, Doraszeki & Segal (2000), and Hurst, Luoh & Stafford (1998) show significant differences in wealth among married and single families.

15 This proposition needs to be further researched by linking cross-sectional variables to freedom dates of free blacks.

16 Note that explained differences in wealth after emancipation also reflect pre-emancipation legal barriers from choosing characteristics conducive to wealth accumulation.

17 1860-1870 white differences in wealth fell 158 basis points points due to differences in returns to age.

19 Blacks saved 11 percent of their income while whites saved 10 percent of their income.20 A unique finding was that stocks and bonds, however, were less evenly distributed among whites when considering nonzero wealth.

21 Magnuson (1995a) and Steckel (1991) recommend that researchers pay careful attention to enumeration the procedures before investigating this data. Magnuson reports that the U.S. Census is not a "pure reflection of general societal trends" (p. 11). The census is composed of questions, which have and have not persisted over time. Between 1790 and 1840, the unit of enumeration was the household, based on given set of characteristics, i.e. Colored-Male-Over Age 16. The 1850 U.S. Census was considered the first\ modern Census when the unit was changed to the individual. Magnuson also noted that a proposed slave schedule would have collected extensive information on the ancestors of modern-day African Americas. In 1840, Congress formed the Census Board that unsuccessfully recommended a slave schedule for the 1850 U.S. Census--which would have included the names of slaves, birthplace of slaves and number of children (Magnuson 1995a, p.19). Steckel reminds us that the original purpose of the US census was for taxation and US House of Representatives appropriations. However, a "growing desire for statistical information, curiosity about society, and heightened interest in international and regional comparisons led to expanded collection by the federal census" (Steckel 1991, pp.582-83). Steckel suggested that the likelihood of error increases as early census data is more disaggregated. He noted that under-enumeration, over-enumeration and misreporting are errors that affect the quality of census data and led to the creation of the Census Bureau. Some of these errors may be attributed to the poor training of early enumerators and lower quality of early census administration. He found that larger households,

lower-educated persons and persons with poor English-language skills tended to be omitted from the census. Steckel (1991) provided several examples of under-enumeration in census data collected on blacks. He recommended using census comparisons, census matching, and consistency checks to evaluate errors and improve the quality of samples from the early census.

22 Real estate value was enumerated based on guidelines specified in the Circular to Marshals. It specified that "under heading 8 insert the value of real estate owned by each individual enumerated. You are to obtain the value of real estate by inquiry of each individual who was supposed to own real estate, be the same located where it may, and insert the amount in dollars. No abatement of the value is to be made on account of any lien or encumbrance thereon in the nature of debt" (Magnuson 1995b, p.347) Personal estate value was also enumerated based on guidelines that specified "Personal estate is to be inclusive of all bonds, stocks, mortgages, notes, live stock, plate, jewels, or furniture, but exclusive of wearing apparel" (p.349)

23 Prior to 1865, blacks were not only stratified by skin color--black and mulatto--but they also functioned based on heterogeneous legal rights. Blacks were either bounded in slavery or free, contingent on appropriate documentation. The 1850 and 1860 IPUMS samples only include free blacks. As reported earlier, no detailed individual-level data is available on slaves. Thus, averages of wealth and property holding in the descriptive statistics were weighted based on (i) the size of the free black population relative to slave population in 1850 and 1860 and (ii) the assumption that slaves had no personal and real estate. Blacks were 15.7 percent of the US population in 1850 and 14.2 percent of the population in 1860 (Cramer, 1997). But free blacks represented 11.9 percent and 11.0 percent of the black population, respectively. The unweighted averages in 1850 and 1860 represent the experience of (i) the average free black and (ii) the average black if slaves were freed earlier. The decade before the Civil War was a ripe environment for economic prosperity. Thomas Weiss (1992) found that Gross Domestic Product (GDP) grew by 1.96 percent between 1850 and 1860--higher than any other decade in the pre-war era. He suggested that although perishable output and shelter were the primary components of the gain, residual output also increased significantly. The residual was “the portion of output beyond apparent basic necessities… this was the output needed for industrialization, and of course provided as well the discretionary items that are the fruits of economic progress. In this light, Americans were advancing in style” (Gallman, p.30).

24 These estimates are consistent with the estimates of Soltow (1972; 1975). Although Soltow (1972) only collected a sample of 393 non-whites in 1870, he found their average wealth was $73, compared to $2,661 among whites. Soltow (1975) found similar differences in free black and white wealth using a sample of 151 blacks. He conducted one of the first in-depth studies of mid-nineteenth century wealth accumulation patterns using the census population schedules. Note that these schedules were originally are stored on microfilms. He spun the microfilm half-turns to collect random, cross-sectional samples from 1850-1870. He found that average black wealth in 1870 was $74 while average white wealth in $2,691.

25 The value of southern total estate was inflated by the value of slaves. Slave owners included the value of slaves in their personal estate.

26 White occupational concentrations changed quite dramatically between 1850 and 1870. The portion of white unskilled workers grew 46.2 percent between 1850 and 1860 and 57.3 percent between 1860 and 1870 while the portion of white-collar worker grew less dramatically during this period. The portion of white-collar workers grew 25.8 percent between 1850 and 1860 and 12.1 percent between 1860 and 1870. Simultaneously, the portion of white farmers fell 9.3 percent between 1850 and 1860 and 8.4 percent between 1860 and 1870. Naturally, this coincided with a continual decline in farm ownership among whites over the twenty-year period.

27 White demographics gradually changed over the twenty-year period. The number of persons in a household, number households with children and number of children all fell. Simultaneously, the number of white male and white married household heads fell. Among free blacks, the proportion that was male and married also fell between 1850 and 1860.

28 The only dramatic regional differences among whites prior to 1870 were changes in the western and foreign-born population. 12 percent of whites lived in west in 1850. This portion of the population grew by 129 percent between 1850 and 1860 and 12 percent between 1860 and 1870. Additionally, the portion of white foreign-born population grew by 52 percent between 1850 and 1860 and 10 percent between 1860 and 1870. See Ferrie 1999. 1850 and 1860 free blacks were regionally different than whites and all blacks in 1870. Only one-in-two free blacks lived in slave states, with the remaining plurality living in the Mid-Atlantic. More than one-in-three free blacks lived in urban areas between 1850 and 1860—significantly larger than whites and all blacks in 1870. One-in-three free blacks were also born outside of the southeast region in 1850 and 1860. Furthermore, 34 percent of free blacks migrated to a different state in 1850 and 1860 and over seventy percent of these migrants migrated to a new region.

29 Ferrie (1999) conducts a thorough analysis of the immigrant experience during this period.

30 Margo (1990) used data from Smith (1984) to show that the average amount of schooling was seven years around the Civil War (Margo, 1990, p.15).

Appendix A: Extended Review of Modern Literature

The following review of the literature is based on *empirical* difference in wealth, (*i*) based on observed differences in distribution of wealth, (*ii*) locality differences in wealth, and (*iii*) regional differences in legal protections of individuals based on skin color.

Overall distributional comparisons also show significant differences in black and white wealth. Terrell (1971) used Gini coefficients and distributional analysis to show black wealth was less evenly distributed than whites. Hurst, Luoh & Stafford (1998) analyzed PSID data to analyze black-white wealth differences and found that the wealth of blacks was more mobile than the wealth whites due to a more narrow wealth range among blacks. They also found that 70 percent of blacks in the sample still had no wealth after 10 years passed. Using distributional analysis such the Lorenz Curve, they found black wealth grew faster during the 10-year period but these changes were not observable in the overall distribution of wealth due to large difference in distributional patterns among blacks and whites.

Franklin Smith (1975) analyzed a sub-sample of DC residents in the mid 1960's to observe similar black-white wealth differences. He used 1967 DC Estate Records and descriptive statistics to show that blacks possessed 1/19 of white estate in DC. Using a log regression analysis of black wealth, he also found blacks in DC still owned $3300 less wealth (in 1967) when controlling for age, gender, occupation, marital status and birthplace.

Conely (1999) used results from analyzing 1984-94 PSID data to propose that legal and class barriers were the source of black-white wealth differences. He suggested that there were legal barriers to economic growth in the black community, including black codes in the south (e.g. SC), coerced failure of Freedman's Bank in 1874, racial discrepancies in Old Age Insurance in 1935, redlining in HOLC in 1933, and redlining in Federal Housing Authority & Veterans Administration in 1937. Using regression analysis of log wealth, Conely found parental wealth had a more significant impact on net worth than race and suggested that social class is more important than racial differences.

Appendix C compiles literature on the subcomponents of wealth. Wealth is a function of initial wealth, (*inheritance*), or intergenerational transfers; (*income* and) *savings*; rate of return to storing wealth in financial *assets* (including) *homes;* and the composition or size of family or *household*. The following describes literature of statistical results concerning wealth.

Inheritance. Several studies have focused on the role of initial wealth or intergenerational transfers on black-white wealth differences. Menchik & Jiankopolos (1997) found effects of intergenerational transfers on black-white wealth differences. They used 1976 National Longitudinal Surveys and 1989 Survey of Consumer Finances to conduct regression decomposition. Foremost, they calculated permanent income using predicted current income at age 60. Explained wealth differences ranged between 30-37 percent of the 1976 pooled sample; 58 percent of 1989 married sample; and 72 percent of the 1989 single sample. But they found 25 percent of white households and 10 percent of black households received inheritance but only 10-20 percent of the explained differences were due to inheritance. Using tobit analysis, they found white households with fewer children, with more schooling among fathers and with

deceased parents had higher probability of receiving inheritance. Wolff (1998) confirmed these results. He used 1983 –1995 SCF data to show that blacks and whites possessed different proportions of their wealth originating from inheritance (blacks: 11 percent vs. 24 percent for whites).

Altonji, Doraszelski & Segal (2000) observed limited effects of intergenerational transfers on black-white wealth differences. They used 1984-1994 PSID data to conduct OLS and fixed effect regression decomposition. To obtain the fixed effect, the calculated permanent income from an individual-specific effect of income regression normalizing age to 40. To conduct fixed effect decomposition, the authors used sibling differences to net out a fixed inheritance effect and found little change in results. Explained wealth differences ranged between 30-111 percent for pooled sample depending on the coefficient used in the analysis. After conducting a fixed effected analysis of sibling differences and comparing to OLS results with no fixed effect, the authors found no significant differences: controlling for inheritances does not change the portion of unexplained differences significantly. They proposed that differences in savings or rates of return might be more effective in explaining black-white differences in wealth than intergenerational transfers.

Income and savings. Additional studies concentrated on this role of income and savings in black-white wealth differences. Using 1983-84 SIPP data, Oliver & Shapiro (1989) find that income differences do not explain wealth differences. They show that wealth and financial assets differed among blacks and whites when controlling for income groups. Blacks had less than 50 percent of the wealth held by whites across all income categories while less than 25 percent of the financial assets held by whites. Conley (1999) confirmed his results. He found that blacks had less wealth at all levels of income even though blacks saved more than whites19 and blacks were self-employed more than whites (12 percent vs. 10 percent).Using the results, Henry Terrell (1971) also found large differences in black and white wealth when for

education and income. Franklin & Smith (1977) used 1967 DC Estate Records to show that black and white net worth also differed when controlling for average income.

Wolff (1992) uses SCF, SFCC, and SIPP from 1940 – 1988 to show that the black-white difference in net worth exceeded differences in income. The black-white income ratio held or rose to 60 percent from 1940 to 1985 while the black-white ratio of net worth was below 25 percent from 1962 to 1988.

Assets. Additional studies have focused on the role of financial assets in wealth differences. Brimmer (1988) used 1984 Census data to show that blacks held 5 percent or less of any individual asset. Stocks consisted of 2 percent of black net worth and 0.13 percent of US stocks. Additionally, he found that whites at lower incomes were more likely to hold stocks than blacks. Snyder (1989) confirmed these asset differences. He used 1982 NBS data to show that black asset portion of the retirement portfolio (3.6 percent) was smaller than the portion in the Hispanic portfolio (9-10 percent) and whites (20 percent). Terrell (1971) also confirmed significant asset differences among blacks and whites. Descriptive statistics from 1967 Survey of Economic Opportunity data show that blacks held 24.1 percent of white non-financial assets and 6 percent of white financial assets. But 72 percent of the black non-financial assets were in consumption services while only 53 percent of white assets were stored in this manner20. Wolff (1998) also found larger differences in financial assets decades later using 1983-95 SCF data. The black-white ratio of mean financial worth fell to 11 percent while black-white ratio median financial net worth held constant at 0 percent.

Some research has estimated the source of asset differences among blacks and whites. Using **probit** regression analysis, Hurst, Luoh & Stafford (1998) found blacks are less likely to own stocks and transaction accounts when controlling for income and demographic variables. They suggested that lack of experience with transaction account ownership may impact potential ownership of other assets. Chiteji & Stafford (1999) confirmed this proposition. They used 1984 and 1994 PSID data to analyze the role of financial asset accumulation on black-white wealth differences. Probit analysis shows that parental ownership of stock increases the probability of stock ownership among young families causing race to become statistically insignificant. Keister (2000) also confirmed these findings. She used SCF data from 1983 and 1986 to analyze black-white wealth differences. Using **logit** regression analysis, she shows that blacks were less likely to own high-risk assets (such as business assets, stocks, and bonds) after controlling for income, education, age, marital status and ownership. She also found that past ownership of assets predicts current ownership of assets.

Furthermore, income predicts ownership of assets but education variables were not consistent across past and current owners. Finally, she used a simulation method to show aggregate improvements occur in the distribution of wealth when removing race effects and augmenting black education effects.

(Assets of) Homeownership. Wolff (1992) uses SCF, SFCC, and SIPP from 1940 – 1988 to show that the black-white difference in net worth exceeded differences in homeownership. The black-white homeownership ratio held or rose to 60 percent from 1940 to 1985 while the black-white ratio of net worth was below 25 percent from 1962 to 1988. Even though wealth differences ranged further than homeownership differences, their correlation remained unchanged. Birmbaum & Weston (1974) used 1967 SEO data to show the correlation of wealth and homeownership. They used GLS regression analysis to calculate the predicted probability of owning home using a sample split by race. They found differences in wealth increased the explained differences in the probability of homeownership. They also found that the black wealth portfolio primarily consisted of homes unlike white wealth: 72 percent of black wealth

while only 35 percent of white wealth was in homes. However, 59 percent of whites own homes while only 39 percent of blacks owned homes.

The Household Structure. Keister (2000) shows a significant impact of resource dilution of (household structure) on wealth. She used 1985 and 1996 NLSY data to analyze the role of household structure on black-white wealth differences. She provides a review of the literature on the theory of resource dilution—the impact of family organization on material resources, parental attention, intervention and child opportunities—and shows that it accounts for an inverse relationship between the number of children and education outcomes. Using GLS regression analysis and **logit** analysis, she found that resource dilution impacted the accumulation of black and white assets differently, the probability of blacks and whites owning assets differently, and upward mobility among blacks and whites differently.

Appendix B: Data and Descriptive Statistics

This study compares modern analyses with modern empirical results to the modern analyses of James Curtis Jr with older data and empirical results from the IPMUS (Integrated Public Use Microdata Samples). IPUMS data are based on national representative samples and supplemental over-samples of minorities from the population schedules of the US census manuscripts. The US conducted its first census in 1790 and its first modern census in 1850. By 1850, the census had improved such that we can now investigate the past with new insights. Modern census data is a rich set of cross-sectional, individual-level data on American families and individuals 21.

This study analyzes US census samples from the 1850-70 . These census manuscripts contain responses to important socioeconomic inquiries including age, sex, color, marriage status, literacy, whether the individual attended school during the year, occupation, state or country of birth, value of real estate, and value of personal estate (1860 and 1870 only)22. Economists have conducted an extensive amount of research based on national samples from the early US census manuscripts (see e.g. Ferrie 1999, 1994; Steckel 1990; Becker & Tomes 1986 and Soltow 1975, 1972).

The sample studied in this paper was restricted to heads of households. Investigating the wealth from a random sample of household heads is more productive than investigating a random sample of individuals. Wealth is often used to purchase durable goods and durables are more likely to benefit the entire household rather than one individual in a household.

Furthermore, census enumerators tended to sum up the wealth of a household and report it under the head of household. The final sample includes a 1-in-100 random sample from the 1850-70 censes and supplemental samples of 1-in-50 blacks in 1860 and 1870. The racial breakdown of the pooled sample is 21,416 blacks and 154,569 whites23.

Descriptive Statistics

The following describes the means of the variables in the sample. Five years after emancipation, blacks, on average, held $71 in real estate wealth while whites held $2,437 24. Given that blacks held only 2.9 percent of the average white real estate wealth in 1870--up from the 1.5 percent in 1850 and 1860, the fact that the growth of real estate wealth favored blacks over this time period may not be surprising. Among blacks, average real estate wealth, adjusted by regional prices, grew by 28 percent between 1850 and1860 and 33 percent between 1860 and 1870. Among whites, price-adjusted real estate wealth also grew by 28 percent between 1850 and 1860 but fell by 25 percent between 1860 and 1870. This white wealth recession was primarily due to the losses incurred by the southern whites after the Civil War.

Property-holding patterns were similar to real estate wealth patterns. Only 6.7 percent of blacks in 1870 held property (or a positive value of real estate wealth) while 54.6 percent of whites held property in 1870. The growth in black property-holders outpaced the growth of black real estate wealth. Blacks property holders grew 17 percent between 1850 and 1860 and 148 percent between 1860 and 1870. Among whites, property holders grew by five percent between 1850 and 1860 and fell two percent between 1860 and 1870. Overall, the ratio of black to white property holders was 12.2 percent in 1870, up from 4.3 percent in 1850 and 4.8 percent in 1860.

Blacks made similar gains in the total estate. Total estate includes the value of personal estate and real estate 25. On average, the value of black total estate wealth, adjusted by regional prices, was $124 in 1870 while whites held $3,548 in total estate. Total estate wealth grew by 47 percent between 1860 and 1870 among blacks while white total estate wealth fell 33 percent between 1860 and 1870. Black total estate holders (or blacks possessing a positive value of total estate wealth) grew by 265 percent to 23.5 percent in 1870 while white total estate holders fell by 9.6 percent to 75.8 percent in 1870. Overall, the ratio of black to white total estate wealth was 3.5 percent while the ratio of black to white total estate holders was 31

percent in 1870.

Black-white differences in schooling and employment were also quite large in 1870. 14.6 percent of the black population was literate while 88.5 percent of the white population could read and write. While 89 percent of both, blacks and whites, were employed, occupation concentrations were different. In 1870, 70.5 percent of blacks had unskilled jobs, compared to 23 percent of whites. In contrast, 18.8 percent of blacks were either white- collar workers or farmers, compared to 53.8 percent of whites26.

Blacks and whites were also different demographically in 1870. 18 percent of black households had female heads while only10.7 percent of white households had female heads. Similarly, only 71.6 percent of black household heads were married while 81.8 percent of white household heads were married. White households also had more residents, including children. Furthermore, the average age of the white household head, youngest child and oldest child is older than the average ages of the black household head, youngest child and oldest child, respectively 27.

Regional differences were also quite large in 187028. Only one-in-four whites lived in former slave states while nine out of ten blacks lived in former slave states. As a result blacks were more likely to live in rural areas than blacks (86.3 percent of blacks to 71.8 percent of whites). This occurred because whites were more regionally mobile than blacks. 35.9 percent of blacks migrated from their birth state and 45 percent these migrants reside in a new region.

However, 59.7 percent of whites migrated from their birth state and 80 percent of these migrants changed regions. The key regional difference may be that only 11.4 percent of blacks were born outside the Southeast while the largest birth segment among whites were foreign born (28.2 percent) 29.

These descriptive statistics document the general improvements in the condition of the average black relative to the average white after the abolition of slavery.

Appendix C: Theory of the Components of the Wealth Identity

Wealth is determined by (*i*) *wage* rates offered by firms, (*ii*) individual choices of *hours of work* and commodity consumption, (*iii*) *market prices of commodities*, (*iv*) *initial wealth* of individuals and (*v*) market *rates of returns* on invested initial wealth and savings. See Appendix A for (comparative literature on) the theory behind each of these elements of wealth.

(i) Wages. Consider the following single period model, formalized by Arrow (1972), where owners of firms seek to maximize their utility, which includes short-run profits & types of labor.

(ii) Choice of Hours of Work and Commodity Consumption. Ham, Jakobsun & Reily (1998) estimate parameters from labor supply equations derived from the Lucas-Rapping Model where:

> "The lifetime utility function is assumed to be additively separable over time. The current within-period utility is a non-additively separable function of food consumption, other non-durable consumption and male labor supply… We rule out corner solutions by assuming that the individual consumes a positive amount of both goods and provides at least one hour of male labor supply in each period. Finally, the consumer is assumed to face no additional constraints in any market, including the

> labor market. In this situation the consumer faces only a period t lifetime wealth constraint. (pp.7-8). Using the first order conditions, Ham, Jakobsun & Reily (1998) show how structural and reduced-form labor supply regression equations can estimated. They also "consider a Keynesian or disequilibrium model of the labor market as an alternative to the L-R model. In these models unemployed individuals cannot work as much as they would like to during a given year because they face a constraint on their labor supply" (p.11).

They show that hours of work can be estimated using wage rates, food prices, non-durable commodity prices and industry or occupation unemployment rates.

(iii) Market prices of commodities. When markets are competitive and firms have all the same cost structure, a large number of firms and buyers in the market cause prices to be fixed at the additional cost to providing the good or service because information is fully available on alternative suppliers and customers. Furthermore, free entry and exit price markups, causing market prices to be at equilibrium and markets to be efficient—where voluntary participation in a market-oriented distribution of goods and services maximizes the net gains to producers and consumers.

However, when markets are less competitive, such as monopoly, prices are marked up over the additional cost to providing the good or service, based on consumers' responsiveness to price and the producer's share of the market. This leads to an amount of goods and services, which are bought and sold, that is below the competitive market outcome leading to inefficiencies and additional gains from government regulation. Moreover, when markets are less competitive, producers can price discriminate if they know the willingness and ability of individual consumers to purchase their goods and services. While such practices are generally accepted and encouraged for goods such as senior and student movie theater tickets or lunch and dinner restaurant prices, price discrimination based on race is equivalent to statistical discrimination—making predictions about a person based on membership in a certain group (Stockton, 1999, p. 434) and using an individual's membership in a certain group as information on the individual's skill and productivity (Borjas, 2000, p.357). Offering an individual in a racial group a price that is different from a price offered to an individual in another racial group, such as mortgage rate, (holding all other variables constant), constitutes economic discrimination. The gains to firms from these practices are the equivalent to the gains to firms specified from offering different wage rates discussed in section one.

(*iv) Initial Wealth*. Initial wealth is obtained through inheritance or intergenerational transfers. Becker & Tomes (1979) formulate a model for initial wealth where families choose wealth of the children or investments in children and parental consumption to maximize the family utility function subject to parental income constraint, child (or children) income constraint and endowments.

(v) *Rate of Return*. Schlomo Yitzhaki (1987) models the group-specific rates of return using sale and purchase price of assets:

> "The…simpler way for calculating the rate of growth of wealth for comparing groups of investors, is to find out, for each group the total value of wealth at the beginning and the end of the period, and then calculate the instantaneous rate of growth of wealth. Formally… we have to aggregate the costs and the proceeds for each holding period and then calculate the rate of growth. Actually, this is the rate of return of the investors for their investments… (Furthermore) if we have several observations on the rate of return on a portfolio—we have to aggregate them first and then calculate the rate of return." (pp. 80-82).

Thus, the rate of return is function of sale and purchase price of assets.

Discrimination in the price of assets, such as real estate assets, can cause certain groups to obtain a lower sale price or pay a higher purchase price, and thus, obtain a lower rate of return than obtained by members of other groups. There is an extensive literature on how such discrimination can occur in housing market prices. For instance, Martin Bailey (1959) first introduced the border model. His model assumes that:

> "Members of group X prefer living near group Y to living entirely surrounded by other members of group X, while members of group Y prefer to live entirely surrounded by other members of group Y. " (Members of group Y) considers it unpleasant to live near people with lower incomes and with tastes and habits 'inferior' to their own, while the reverse is sometimes and perhaps not generally true…(Furthermore) Suppose streets A, B, C, and D are occupied entirely by members of group X, while streets E, F, G, etc. are occupied entirely by members of group Y; and suppose that only occupants of streets D and E consider themselves affected by their proximity to members of the opposite group. Under the assumed conditions, if people do not anticipate any change, the properties along street D will sell (and rent) at prices higher than those along streets A, B, and C, and the properties along street E will sell (and rent) at prices lower that those on streets F, G, etc." (pp.288-89).

Thus, group specific rates of returns are not only determined by sale and purchase price of assets, but are also determined by the preferences of those that affect the price of the asset, similar to the discrimination coefficient that affects the size of wages paid to different groups.

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